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ABSTRACT

An evaluation of the New York State Experimental Prekindergarten Program was begun in 1975 to provide longititudinal data on the effects of prekindergarten on children's development over a period of 5 years. Data were collected on a variety of items, including children's test performance at various times, family background, ratings by teachers, attendance, services received, teachers' observations and other documentary materials, parents' participation in the program, and children's progress through school. Measures of performance included three areas of cognitive functioning: general reasoning, school-related knowledge and skills, and knowledge of verbal concepts. Noncognitive and behavioral characteristics such as task orientation, extraversion, and verbal facility were also assessed. In addition to the study of program outcomes, an attempt was made to increase the degree of program continuity in seven districts and to identify lasting effects of continuity on learning. The children of greatest interest were those who entered prekindergarten in the fall of 1975. To corroborate results obtained for the first group tested, 4 years of data were collected on a second group entering prekindergarten in the fall of 1976. Pretests and posttests were administered to a sample of children from each class entering in 1977 through 1979 and, for the first two groups, two control segments were established. The development of analytical procedures is described, and results are reported and discussed. (RH)

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EVALUATION OF THE

NEW YORK STATE EXPERIMENTAL PREKINDERGARTEN PROGRAM

FINAL REPORT

PS 012878

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Foreword

This final report of the evaluation of the New York State Experimental Prekindergarten Program condenses the work of more than five years into fewer than two dozen pages. In doing this, it inevitably oversimplifies the activities and results of the project. More detailed reports are available for most phases of the study.

This report describes the major findings of the evaluation, including some findings not previously reported. The new findings do nothing to change the general nature of the earlier results.

The evaluation project was a cooperative effort between the Bureau of Child Development and Parent Education and the Prekindergarten Evaluation Unit. The latter organization was established as a temporary unit for the duration of the study.

Requests for information about the Experimental Prekindergarten Program and the staff development component should be directed to the Bureau of Child Development and Parent Education. Inquiries about the evaluation study should be directed to the Division of ESC Education Planning and Development.

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EVALUATION OF THE

NEW YORK STATE EXPERIMENTAL PREKINDERGARTEN PROGRAM

The New York State Experimental Prekindergarten (PreK) Program was started in 1966 to determine whether organized preschool educational experiences can help overcome potential education deficits in the backgrounds of disadvantaged children. Funds were made available to selected school districts to provide a comprehensive educational program for three- and four-year-old children. State funding has continued since, ranging from $5 million in the first year to a high of $10.1 million. During 1981-82, $9.46 million in state funds were allocated to the program.

Each year the program serves approximately 5,000 four-year-old children and 1,500 three-year-old children.

An evaluation of the program was started in 1975 as a longitudinal study of effects of PreK on children's development over a period of five years. The first group of children to be studied entered PreK in the fall of 1975 and completed the third grade in June of 1980. During the intervening period, data were collected on a variety of items including children's test performance at various times, family background, ratings by their teachers, attendance, services received, teachers' observations and other documentary material, parents' participation in the program, and children's progress through school. The last of the data were collected by local school personnel in June of 1980.

The original plan for the evaluation (State Education Department, January 21, 1975) contained a set of general questions, agreed to by the State Education Department and the state Division of the Budget:

1. Do Prekindergarten programs have a measurable effect upon children's cognitive and noncognitive development between the time they enter and leave the program?

2. Do Prekindergarten children possess measurable advantages in cognitive development over non-prekindergarten children at the time of entry to kindergarten?

3. Does Prekindergarten experience have a measurable effect on children's cognitive development up through the time they complete the third grade?

4. Are there specific variations in Prekindergarten programs which result in significantly different levels of cognitive and other development in their students?

5. Can program components or variations be identified which contribute to greater success of particular programs in producing lasting increases in the level of cognitive and other development?

6. Will the systematic collection and analysis of data, carried out in examining the previous questions, provide a baseline for decision makers in studying staff, schedules, objectives, materials, child and parent characteristics, and children's mental ability and cognitive development?

The Program

The longitudinal nature of the study, and especially question #5 listed above, made it clear that the evaluation must consider not only the prekindergarten program itself but also the nature of the program the children entered upon leaving PreK. The program was therefore extended to include, in a subset of districts, activities in kindergarten and the primary grades which would make it possible to assess factors which might contribute to lasting effects of the PreK program. Thus, the program had two parts:

1. The prekindergarten program.

2. A staff development component designed to increase the continuity between PreK and the primary grades.

The Prekindergarten Program

The Experimental Prekindergarten Program was designed to serve children who, because of conditions in their homes or neighborhoods, may not be able to receive the maximum benefit from school. Children are selected for the program on the basis of low economic status and special needs resulting from overcrowded housing, racial segregation, chronic illness in the family, or a family record of poor school achievement.

The program gives special attention to the individuality of learning of each child, taking into account differences in rates of learning and modes of learning. Relationships are sought between various areas of learning. Self-initiated and independent learning of children are reinforced. The process of learning is viewed as continuous, with new learning building on the old.

The program has four components:

1. In-school experience. The in-school experience for children is based on their interests, needs, and strengths. Facilities, equipment, materials, and activities are chosen to capitalize on the ways in which children learn.

2. Health services. Physical, mental, dental, and nutritional services are provided. They include preventive health education, examinations, and assistance in getting immunizations and treatment through proper community agencies.

3. Social services. This assistance helps families to become independent in meeting their own needs and in using community resources.

4. Involvement of parents. The early childhood education program supplements the home, reinforces its values, and emphasizes the contribution of the parent as the first teacher. Parents are involved in a number of ways, including: employment in the program, home visits by staff, parent visits to the school, educational programs on child-rearing practices and skills, and participation in decision-making about the program.

The guidelines (State Education Department, undated) for districts to use in preparing applications for the Experimental Prekindergarten Program call for "a highly individualized, well balanced program that recognizes each child as a whole and unique human being and places emphasis on the total environment, indoors and outdoors (p. 1)."

The goals of the program (State Education Department, September 1971) are:

1. To enhance thinking.

2, To foster a sense of trust in adults and in the children's environment.

3. To develop an adequate self-concept.

4. To develop feelings of confidence and self-worth.

5. To integrate the functions of communication.

6. To develop problem-solving capabilities.

7. To stimulate imagination.

8. To develop self-discipline.

While districts are permitted some latitude in implementation, the program should include the following, as excerpted from the guidelines:

1. The use of expressive materials and activities which put a premium on personal choice and invention rather than on response to teacher direction.

2. Planning for individual differences, for experiences geared to a wide range of ability, and for materials geared to many interest levels.

3. Opportunities for individual interactions with materials, experiences, other children and adults, and freedom to move from group to group and from one interest center to another.

4. Activities and materials which promote intellectual development, independence, and body mastery.

5. Highly individualized contacts and highly personalized relationships with supportive adults.

6. An active workshop approach, namely: active involvement, handling, and constructing, coupled with purposeful trips and verbal labeling.

7. An environment which provides a few carefully placed objects, sufficient space, and small groups with few auditory distractions.

8. Adult models of correct speech, constant guidance in providing appropriate labels to the environment, and encouragement of any attempt of the child to communicate.

9. Opportunities to make plans and to observe cause-and-effect relationships.

10. Systematic encouragement of parents to participate in the program.

11. An interdisciplinary approach to educating children.

An impression of the recommended program is provided in a description of the daily program (State Education Department, February 5, 1966):

> The structure of the daily program's plan is flexible, allowing time for leisurely transition between activities and featuring large blocks of time. Fluctuating interests and individual needs are provided for through a variety of self-chosen activities with adult guidance geared to the individual child. The large time blocks include provision for small-group activities such as music, rhythms, discussions and stories, and, as the children develop a feeling of groupness and as their common experiences are expanded, their ability to participate in groups will increase and the quality of group activity will be enhanced.

Staff Development to Increase Continuity

A concern which educators have expressed about preschool education programs is whether positive effects of the programs, regularly reported in research studies, are maintained over a longer period of time (Bronfenbrenner, 1974; Wolff and Stein, 1966; and Westinghouse Learning Corporation, 1969). Accompanying this concern is the need to determine the conditions under which preschool programs are most likely to have positive long-range effects.

To address this issue, the project was designed to investigate the impact which continuity in the children's program might have in producing lasting effects on the children's development. Seven districts were identified for study in depth. These districts had exhibited commitment to developing program continuity or were judged to have the greatest potential for developing it. An attempt was made to increase the degree of continuity in these districts as well as to identify its effects on long-term learning.

Three children were selected in each district for intensive study. For each child, a team was formed consisting of the child's past, present, and future teachers as well as nonteaching staff members and the building principal. The team worked together as the child moved from PreK into kindergarten and then into the primary grades. The team focused on developing their skills in observing children; recording their observations; collecting meaningful data from interviews, parent conferences, school records, and samples of children's work; reviewing data; and using data for planning instruction.

It was found that after participating in staff development teachers were better able to: (1) capitalize on children's strengths and interests; (2) provide varied experiences to meet individual children's needs; (3) make appropriate materials accessible to children; (4) relate present and past learning; (5) integrate current learning experiences; (6) communicate with parents and involve them in the education of their children; and (7) make effective use of colleagues and specialists.

The processes and the team structure were based on the premise that by studying a small group of children, the teachers and the team could increase the degree of continuity for all the children they serve.

The Children

Prekindergarten Children

The children of primary interest were those who entered PreK in the fall of 1975. This group was designated Wave I. The group entering PreK in the fall of 1976 (Wave II) was also studied. Only four years of data were collected on Wave II because the children completed only the second grade during the course of the study. Results obtained in studying Wave II were used primarily to corroborate Wave I results. A sample of children from each class entering PreK in 1977 through 1979 was also pre- and posttested.

In the fall of 1975, the Experimental Prekindergarten Program enrolled 5,245 four-year-old children. Of that number, 1,308 were enrolled in nine community school districts in New York City, 1,262 were enrolled in fourteen districts in Nassau County, and 576 were enrolled in eight districts in Westchester County. The remainder of the children were enrolled in districts scattered through much of the rest of the state.

Forty-two percent of the children were Black, 42 percent were Caucasian, and 13 percent were Puerto Rican-Spanish. Fourteen languages were identified as the primary language of the children. English was the primary language of 82 percent of the children and Spanish of 14 percent. Each of the other languages was the primary language of no more than one percent.

The mean number of years of education of the children's mothers was 10.9 and fathers was 11.1. Homemaker was given as the occupation of 46 percent of the mothers. Forty-two percent of the fathers had occupations in Level 6 on the Warner Scale of Occupational Status (Warner, et al., 1960), which includes such occupations as route saleman, truck driver, and waitress; 25 percent had occupations in Level 5, which includes baker, fireman, and stewardess. The mean family income was $6,980.

Thirty-four percent of the children lived with only one adult. The mean number of children in the family was 2.9.

Control Groups

For the first two waves, two control groups were obtained:

1. A "waiting-list control group," made up of children in districts participating in the PreK program. These children had been identified as eligible for the PreK program and were on a waiting list for admission to the program if openings occurred.

2. An "other-district control group," made up of children in selected districts not operating PreK programs. An attempt was made to select districts which were similar to PreK districts. Within districts, children were selected according to the criteria used in screening children for admission to the PreK program. This group was available for study beginning at the kindergarten level. (Irvine, Horan, Flint, Hick, and Kukuk, January 16, 1978)

A waiting list control group was also obtained for each class entering PreK in 1977 through 1979.

Because no data were collected on the other-district control group during the year prior to the time the children entered kindergarten, there was no way to gauge the children's performance status at the beginning of the study. This made the other-district control group of little value in those analyses which controlled for initial status of the children. Therefore, comparisons of the PreK children's test performance were made primarily with the waiting-list control group. The other-district control group was useful in comparing children's progress from PreK through the primary grades.

The Data

Measures of Performance

Three areas of cognitive functioning were examined:

1. General reasoning was measured by the Walker Readiness Test for Disadvantaged Children (Walker, 1969) at the PreK and kindergarten levels and by the Cognitive Abilities Test (Thorndike, Hagen, and Lorge, 1968) in grades one, two, and three. The change in instruments was necessitated by the fact that many children at the end of kindergarten equaled or approached the maximum possible score on the Walker. This reduces the power of an instrument to discriminate between children of different levels of development.

2. School-related knowledge and skills was measured by the Cooperative Preschool Inventory (Educational Testing Service, 1970) at the PreK and kindergarten levels. Administration of the Cooperative was discontinued after kindergarten because the test focuses on knowledge and skills judged to be important to a child entering school in order to be successful in school. This orientation is not relevant once the child has been in school for a year or two. In addition, as with the Walker, many children approached the maximum possible score when the test was administered at the end of kindergarten.

3. Knowledge of verbal concepts was measured by the Peabody Picture Vocabulary Test (Dunn, 1965) throughout the study. The Peabody can be administered to individuals from 2½ years of age to adulthood. Therefore, it was possible to use it at each point the children were tested, regardless of age or grade level.

Several dimensions of noncognitive and behavioral characteristics were studied. Of primary interest for assessing effects of PreK were three dimensions:

1. Task orientation was measured by the Classroom Behavior Inventory (Schaefer, 1975) and the California Preschool Social Competency Scale (Levine, Elzey, and Lewis, 1969). The Classroom Behavior Inventory contains a scale called Task Orientation/Distractibility. This scale was used as one measure of task orientation. A factor analysis of the California Preschool Social Competency Scale produced a factor which could be described as task orientation (Flint, Hick, Horan, Irvine, and Kukuk, 1980). This factor provided another measure of the characteristic. Task orientation is defined as the tendency to concentrate on tasks and persist until they are completed.

2. Extraversion was also measured by the Classroom Behavior Inventory and the California Preschool Social Competency Scale. Extraversion was another of several factors produced by the factor analysis of the California.

3. Verbal facility was measured by a factor derived from the California Preschool Social Competency Scale. Verbal facility is defined as the willingness to use verbal skills to cope with problems. It is distinguished from verbal ability, which implies capability in using verbal skills but says nothing about the child's inclination to use those skills.

These noncognitive dimensions were selected for study because of their logical relationship to cognitive functioning of children.

A third indicator of the children's performance was obtained by studying the progress of childen through the grades. Whether children move through the grades at the normal rate, rather than being placed in special education classes or being required to repeat grades, is a practical measure of their success in school. It is a more direct measure of success than test scores, which measure certain abilities or characteristics but do not measure how successful children are in applying them.

Background Data

Information was collected about each child's background, including education and occupations of parents; family income and living situation; and the child's birth date, race, sex, language spoken, and previous preschool experience. For children participating in the program, data were collected on their schedule and attendance, support services available, and amount and type of involvement of their parents in the program.

Design of the Study

All four-year-old children in Waves I and II were pretested in the fall of their prekindergarten year. A sample of approximately 1,800 children from each wave was selected to be followed over time for purposes of this study. All four-year-olds in the seven in-depth districts were selected; a random selection was made in the remaining districts. The sample was posttested in the spring of the prekindergarten year. The sample was tested again in the fall and spring of the kindergarten year and in the spring of each grade, one through three. This testing extended only through grade two for Wave II.

Children in the waiting-list control group were tested on the same schedule. However, they were given only the cognitive tests during the first year because the noncognitive instruments required teachers to rate the children, and control-group children were not in school that first year. The other-district control group was added to the study at the kindergarten level. At that level and in subsequent grades, children in the other-district control group were tested on the same schedule as the PreK group.

Studying the Effects of Prekindergarten

Four approaches were used in studying effects of PreK:

1. Comparisons were made between the PreK group and one or both control groups on the various measures at specific points in their schooling, namely at the end of PreK, at the beginning and end of kindergarten, and at the end of grades one, two,

and three. Statistical controls were used for pretest status and for other factors, principally variables related to socioeconomic status of children. Children from all districts were studied in these analyses.

2. Comparisons were made between PreK children and waiting-list control children using all testing points simultaneously. This was a true longitudinal analysis. It included children only from districts in which both PreK children and control-group children were found. It was carried out on only one measure, the Peabody, which was given at all testing points throughout the study.

3. Studies were made of the differential effects of different levels of program components on PreK children. This was done where no control group was available. For example, this approach was used to assess effects of the PreK program on the task orientation of the children; no control group data were available since the instruments measuring task orientation required ratings of children by teachers and the control-group children, by definition, had no teachers during the time the PreK children were in the PreK program. A second example was in the study of the effect parents' involvement in the PreK program had on their children's achievement.

4. Comparisons were made between PreK children and control-group children on their progress from the beginning of kindergarten through the third grade. The proportions of children in each group who made normal progress, who repeated a grade, or who were placed in special education classes were compared.

Studying the Effects of Continuity

Intensive staff development took place in the seven in-depth districts with the purpose of increasing continuity in children's experiences in PreK through grade three. In order to determine the effects of continuity on the cognitive performance of the children, former PreK children in the in-depth districts were compared with PreK children in the other districts, where such intensive staff development had not taken place, and with the waiting-list control group.

The System to Analyze the Data

What would be required of a system to analyze the data? The system must be capable of handling large quantities of data. Each year 5,000 four-year-old children attended the PreK program. Two such groups would be studied over time—one group over a five-year period and a second group over a four-year period.

The system must be capable of handling a diversity of data. Several dimensions of performance were to be studied in the perspective of the children's personal characteristics, home backgrounds, and school experiences.

The system must be able to answer a variety of questions about PreK. Determining whether the program "worked" is not the only purpose of an evaluative study. The nuances of program effects can be important for managers of programs as well as for policy makers. If program effects were found, it seemed important to be able to say how the program affected children from different backgrounds and with different characteristics.

Finally, the system must be flexible enough to permit testing of a variety of hypotheses dealing with overall effects of the program, effects of specific program components, effects on different groups of children, and complex relationships among the variables.

These requirements indicated that an interactive system was needed, a system which could allow the researcher to test sequences of hypotheses efficiently and to branch within an analysis, depending upon the results of each test of a hypothesis.

The knowledge existed to put together such a system. Techniques of multivariate analysis were well suited for use in evaluating large-scale educational programs. Computer programs for managing data and for analyzing data were available. The system which was developed tied these various techniques together into an efficient, powerful and flexible system.

At the heart of the analytical system was the conceptual system for systematically analyzing data. A conceptual system anticipates important questions about the program. These questions deal with effects of the program, the relationships among variables which describe the program and the children, and possible alternative explanations for what appear to be effects of the program. For example, it is possible that the program appears to be effective because certain children score high on a measure of development after attending the program. But could their scores be the result of greater intellectual stimulation in their homes, greater readiness at the beginning of the program, or the fact that they were older than other children? As more such alternative explanations are eliminated, greater confidence can be placed in results which show a relationship between a program and children's performance. The conceptual system provided a means of anticipating such questions and turning them into hypotheses which could then be tested systematically.

The procedure followed was to develop a starting statistical model which contains a variety of information with potential for explaining children's performance. The analyst then systematically simplified this model by testing a sequence of hypotheses designed to eliminate different variables as possible influences on children's performance or to control for the influence of those variables. The objective was to arrive at the simplest statistical model which adequately explained the children's performance.

Such a system is quite sensitive to subtleties in the data. Apparent effects which are actually the result of some concomitant variable are less likely to be interpreted as real effects of the program. And subtle effects of the program, which are likely to be overlooked with an analysis which concentrates on general effects, are more likely to be uncovered.

This system was supplemented in a few analyses by other approaches. Factor analysis was used to simplify and to provide order to the data. A few analyses were carried out using chi-square, which compares the proportions of children falling into different categories rather than analyzing numerical data. This technique is not as powerful as multivariate analysis and does not permit control for concomitant variables. It has the advantage of simplicity, which makes a straightforward interpretation of the results easier.

Analysis and Results

Effects of Prekindergarten on Children's Test Performance

1. Statistical Design for Studying Effects on Cognitive Performance

Cognitive performance was measured by the Cooperative Preschool Inventory, the Walker Readiness Test for Disadvantaged Children, the Peabody Picture

Vocabulary Test, and the Cognitive Abilities Test (CAT). The first three instruments were administered as pretests in the fall of the PreK year. Criteria for studying program effects were scores on the same instruments obtained in the spring of the PreK year and in the fall and spring of the kindergarten year. Beyond kindergarten the criteria were scores obtained by administering the Peabody and the CAT at the end of grades one, two, and three.

Analyses were carried out to compare the PreK group and the waiting-list control group on each of the measures at the end of PreK. The other-district control group was added at the kindergarten level and was tested throughout the remainder of the study. Comparisons were made between the PreK group and both control groups at the beginning and end of kindergarten. It was found that the pretest data were critical in order to assess adequately the impact of the program, so the use of the other-district control group in the analysis of test data was limited after the kindergarten year. Comparisons at the end of grades one, two, and three therefore focused on the PreK group and the waiting-list control group.

In order to control for differences between the groups on factors which were unrelated to the program, several control variables were used. These differed somewhat from one analysis to another, but typically the control variables included pretest scores, mother's educational level, family income, the child's age, and time between the pretest and the posttest.

In addition to differences between the groups of children, the analyses were designed to detect interactions between variables and, in some of the analyses, curvilinearity in the relationships between variables.

2. Effects of Prekindergarten on School-Related Knowledge and Skills

The PreK group scored significantly higher than the waiting-list control group at the end of PreK and again at the beginning of kindergarten. The PreK findings were corroborated by Wave II. In addition to a general effect of PreK on the children's performance at the beginning of kindergarten, interaction effects were found which indicated that the PreK program tended to be most effective for children whose mothers were poorly educated, whose families received less income than was typical for the children studied, and who scored relatively high on the Cooperative pretest.

At the end of kindergarten, no significant difference was found between the PreK group and the control group, even with the use of control variables. This lack of difference might have been due in part to a ceiling effect which was becoming evident at the end of kindergarten: A number of children were scoring near the maximum possible for the measure.

The findings do indicate, however, that children who had attended the Experimental Prekindergarten Program had an advantage at the time they entered kindergarten over similar children in their mastery of knowledge and skills judged to be important in coping with school tasks.

3. Effects of Prekindergarten on General Reasoning

The PreK group scored significantly higher than the waiting-list control group on the Walker at the end of PreK, at the beginning of kindergarten, and at the end of

kindergarten. Wave II results for the end of PreK were similar. At each of the three testing points, there was evidence that the program was most effective for children whose mothers had the least education.

These results gave a clear indication that the Experimental Prekindergarten Program had an effect on children's general reasoning, as measured by the Walker, which lasted at least one year beyond the end of the program.

The Walker was replaced as a criterion by the Cognitive Abilities Test (CAT) at the first-grade level and subsequent levels. In none of the analyses carried out on Wave I at these levels was an effect of PreK still evident. However, Wave II results revealed an effect of the PreK program on children's general reasoning scores at the second grade. Among children who scored low on the Cooperative pretest, PreK children exceeded the control-group children on the CAT at the end of second grade. For children who scored in the middle and high ranges on the Cooperative pretest, there was no difference between groups.

4. Effects of Prekindergarten on Knowledge of Verbal Concepts

The study of the effects of prekindergarten on children's knowledge of verbal concepts was restricted to children whose primary language was English. It was found that at the end of PreK an interaction occurred between the amount of time from pretest to posttest and the PreK treatment. The interaction indicated that a minimum of five or six months in the PreK program was necessary for the program to affect children's knowledge of verbal concepts, as measured by the Peabody. Results for Wave II were more straightforward, showing a significant difference between the PreK group and the control group.

In simple analyses to detect effects of the PreK program at each of the other testing points, no overall differences were found between the PreK group and the control group. However, the program did have a favorable effect on the first-grade test performance of children who had scored high on the Cooperative pretest and also had mothers with low levels of education. There was also evidence that parent involvement favorably affected children's first-grade test performance.

The fact that the Peabody was administered throughout the study provided an opportunity to carry out a true longitudinal analysis and simultaneously deal with another problem of broad-based evaluations, that differences from one district to another might obscure effects of the program.

In the analyses described above, each criterion administered at a particular time was considered separately. The longitudinal analysis tested for differences between the PreK group and the control group on the Peabody at all testing times simultaneously. To be included in the analysis, a PreK child had to meet two conditions: (1) data must be available at each of the several testing points; and (2) the child must be enrolled in a district which also tested control-group children. These conditions, plus attrition from the program during the five years of the study resulted in a PreK group of 44 children and a control group of 28 children. Four school districts were represented. The analysis compared children within a district at the various testing points, with control for possible effects of the pretest, age, mother's education, and family income.

A significant difference was found between the PreK group and the control group within districts, with differences between testing points accounted for by age of the children. These results indicated a favorable impact of the PreK program across grades on children's knowledge of verbal concepts, thus identifying an effect of the program not detected by the more traditional analyses.

5. Statistical Design for Studying Effects on Noncognitive Characteristics

Trying to determine the effects of the prekindergarten program on children's noncognitive characteristics presented a problem growing out of the nature of the instruments used to assess these characteristics. The instruments were rating scales to be filled out by teachers. Since control-group children were not in school during the PreK year, no ratings were obtained for them. To overcome this problem, a different strategy was adopted: The amount of time a child spent in the program would be used as a measure of the treatment. Thus, the analysis was designed to show whether the amount of time children spent in PreK was related to the ratings they received on the noncognitive instruments.

6. Effects of Prekindergarten on Social Competency

Social competency was selected for study because it relates to both cognitive and noncognitive functioning. First, it recognizes the social aspects of development but, by incorporating the concept of competency, suggests that there are abilities which lap over into the cognitive domain. In addition, the California Preschool Social Competency Scale, which was used to assess social competency, includes items describing behaviors which are important for success in school.

The ratings of 1,525 PreK children were analyzed in relation to the amount of time each child spent in the program. Results showed that children with more exposure to PreK tended to receive higher ratings on social competency. This effect was found at all levels of scheduled time and duration. The effect was strongest up to about 600 hours of exposure. Beyond that point, there was a diminishing effect of exposure on ratings of social competency. The effect was independent of the child's age and mother's education.

7. Effects of Prekindergarten on Verbal Facility

In order to understand better the nature of social competency, item scores of the California were factor analyzed. Examination of the content of the items loading on each factor led to the labelling of the factors as follows: (1) Task Orientation; (2) Consideration of Others; (3) Response to the Unfamiliar; (4) Verbal Facility; and (5) Extraversion.

Each of the five factor scores was used as the criterion in an analysis to determine its relationship to the amount of exposure to PreK received by the children. No significant relationship was found between exposure time and any of the first three factors.

Verbal facility incorporates those kinds of behavior which rely on both ability and willingness to communicate verbally. They include such things as using names of others, identifying self, making explanations to other children, communicating wants, and remembering and following instructions.

Results of the analysis showed that children with more exposure to PreK tended to be rated higher on verbal facility by their teachers at the end of the program. This relation held regardless of child's age or mother's education.

8. Effects of Prekindergarten on Extraversion

The extraversion factor on the California includes behavior such as playing with other children, initiating activities with other children, initiating group activities, giving direction to play, helping others, and responding to unfamiliar adults.

Results of the analysis showed that children with more exposure to PreK tended to be rated higher on extraversion by their teachers. Child's age and mother's education were unrelated to extraversion.

9. Effects of Prekindergarten on Task Orientation

The Task Orientation/Distractibility scale of the Classroom Behavior Inventory was subjected to an analysis similar to those described immediately above. Task orientation is the tendency to concentrate on a task and to persist until it is completed.

Results of the analysis showed that children with more exposure to PreK tended to be rated higher on task orientation by their teachers at the end of the program.

Effects of Parents' Involvement on Children's Test Performance

The Experimental Prekindergarten Program requires participating districts to provide means for parents to involve themselves in the program. The purpose of the parent involvement component is to help parents become more supportive of their children's development. This is to be achieved by: (1) involving parents in the educational process of their children in school and at home, and (2) helping parents make changes in those aspects of home environment which limit children's development.

The evaluation investigated the relationship between the involvement of a child's parents in the program and the performance of that child on the three cognitive criteria. Parent involvement fell into five categories: (1) school visits; (2) home visits by staff; (3) meetings; (4) employment in the program; and (5) other contacts. The type of contact and amount of time was recorded in each instance of contact between the parents and the program.

The analysis was designed to determine whether the amount of time parents were involved in the PreK program was related to the performance of their children on each of the three measures of cognitive performance. Possible effects of differences in children's ages, family income, pretest performance, and mother's education were controlled statistically.

The analysis showed that parent involvement had a favorable effect on general reasoning, school-related knowledge and skills, and knowledge of verbal concepts. Finding a highly significant effect of parent involvement on three different dimensions of cognitive development is a striking result. It is persuasive evidence of the broad impact parents can have on their children's learning. In addition, parent involvement

affected general reasoning and school-related knowledge and skills regardless of the child's age, mother's education, family income, or pretest score. This is additional evidence of the breadth of the effect. In the case of knowledge of verbal concepts, the effect was somewhat more limited, being strongest for children who scored lowest on the measure of verbal concepts at the beginning of PreK.

Effects of Prekindergarten on Children's Progress in the Primary Grades

The performance of children in school is a real-life measure of the effectiveness of their educational programs. For that reason, it was important to learn how former PreK children progressed through the primary grades in order to have a direct indication of how well the prekindergarten program had prepared them. If fewer former PreK children repeated grades or were placed in special education classes than control-group children, that would be another kind of evidence that PreK had a favorable effect on children.

For this phase of the study, the PreK sample consisted of 1,348 children. The waiting-list control group and the other-district control group were combined to provide a control group of 258 children. In both the PreK group and the control group, children who made normal progress up to the time of the analysis would have been in the third grade.

The control group was found to be favored on some factors which could affect performance. For example, the average level of mother's education was 12.0 years for the control group and 10.9 years for the PreK group. Such differences were not corrected statistically in this analysis as was done in the analyses described above.

The progress of the former PreK children was compared with that of the children in the control group by means of a chi-square test of significance. It was found that significantly fewer PreK children than control-group children had repeated grades or been placed in special education classes.

If the progress of the former PreK children had been the same as control-group children, 68 would have been placed in special education classes and 287 would have repeated one or more grades. The numbers of children placed in special education and repeating grades appear to have been reduced by 42 and 75, respectively, by virtue of their attendance in PreK. Thus, in the sample of 1,348 former PreK children, 117 children who might not otherwise be adequately meeting the requirements of school were making normal progress.

Projecting these figures to the estimated 45,000 children entering New York State's schools each year from disadvantaged backgrounds suggests that substantial savings in the cost of special education and remediation might be realized by expanding educational opportunities for preschool children.

The finding that proportionately fewer former PreK children than control-group children repeated grades or were placed in special education classes is even more impressive since the average level of mother's education was higher for the control group. Mother's education had been found to be positively related to pupils' achievement in other aspects of the study of PreK (Hick, Irvine, Horan, Flint, Kukuk, and Fallon, August 1979). In spite of this apparent disadvantage, the former PreK children exceeded the control-group children in maintaining normal progress through the primary grades.

Effects of Staff Development to Increase Continuity

1. Statistical Design to Study Effects of Continuity

Four groups were studied. Three were made up of former PreK children. The fourth was the control group. The groups were:

1. Intensive study group, made up of former PreK children who were the subjects of an intensive process of study and documentation designed to increase continuity. These children were in the seven districts designated as indepth districts. This group was composed of 20 children at the first-grade level, 21 at the second-grade level, and two at the third-grade level (where those two children were combined with the indepth group).

2. Indepth group, made up of the other former PreK children in the indepth districts who were not studied as intensively as the children in the first group. However, because they went to the same schools and were taught by the same teachers as the intensive study group, it was anticipated that the processes used with the intensive study group would increase continuity for them as well. This group contained 344 children at the first-grade level, 73 at the second-grade level, and 121 at the third-grade level.

3. Non-indepth group, made up of former PreK children in districts not involved in the indepth study. The group included 807, 170, and 173 children at the three grade levels studied in this analysis.

4. Control group, made up of children in districts not involved in the indepth study and who had not participated in PreK. The group contained 40, 20, and 25 children at the three grade levels studied.

Two comparisons between these groups were viewed as critical. First, if the activities to promote continuity are to have a broad effect, they must generalize to other children beyond the intensive study group. Therefore, a finding of no difference between the intensive study group and the indepth group would be viewed as desirable, provided a difference was found between the indepth group and the non-indepth group. Second, the difference between the indepth group and the non-indepth group appeared to offer the best indication of effects of continuity, since both groups attended PreK but only the indepth group was in districts where intensive efforts were made to improve continuity. Because of the relatively small sizes of the intensive study group and the control group, statistical analyses involving them are less sensitive than analyses involving the other two groups.

The groups were compared on the CAT and the Peabody which were administered at the end of grades one, two, and three. Statistical adjustments were made to compensate for differences between the groups in (1) mother's education; (2) family income; and (3) scores on each of the three pretests administered near the beginning of PreK.

2. Effects on General Reasoning

Comparisons between the former PreK children in the indepth districts and former PreK children in the non-indepth districts at the end of the first grade showed that the indepth group performed significantly better on the CAT than the non-indepth

group. The impact was not restricted to those children who had been studied most intensively as part of the staff development effort but extended to the other former PreK children in the indepth districts. At the end of the second grade, no difference was found between the groups on the CAT total score. However, on the subtest of the CAT which measures quantitative concepts, the indepth group scored significantly higher than either the non-indepth group or the control group. At the end of the third grade, the results showed that, among those children who had scored lowest on the Cooperative pretest, the indepth group exceeded the non-indepth group in quantitative concepts; for the middle and upper ranges, no difference was found.

3. Effects on Knowledge of Verbal Concepts

When the groups were compared on the Peabody at the end of the first grade, the indepth group exceeded the nonindepth group. At the end of the second grade, a significant difference was also found between the groups. However, the difference was related to the amount of time the children spent in the PreK program. The effect of continuity which was found at the first-grade level still was evident, but only for those children who had spent somewhat more than 500 hours in PreK. No effect on knowledge of verbal concepts was found at the end of the third grade in this analysis.

4. Documentary Evidence of the Effects of Continuity

Observational data, recorded by the children's teachers in the indepth study, illustrate how teachers were helped to capitalize on the individual characteristics of children in order to provide greater continuity in their learning experiences. The continuity through time of a child's primary modes of learning was given attention. For example, documentation on Porter, one of the children who was studied intensively in the indepth districts, contains recurrent observations about his interest in and talent for discovery. The record states, "He loves, and is excellent at, finding what is hidden, and delights in being called detective." This summary is based on observations made by his teacher at different times. Other observations included:

> . . . found 25 out of 26 hidden letters.
>
> To teacher, "You used to have fish." T: "How do you know that?" "I found a can of fish food in your drawer and figured you must of had fish. Can we have them?"
>
> Did an assignment on hidden pictures. He liked to find objects but did not like having to color.
>
> The teacher performed some magic tricks and Porter guessed how one was done. He was quite proud of himself.

These and other observations were used by Porter's teachers to determine his individual interests and abilities. It is interesting to note that, of the children studied intensively, Porter's development in knowledge of verbal concepts most closely paralleled the average for all prekindergarten children: There was substantial gain during PreK, a plateau between the end of PreK and beginning of kindergarten during which no gain was made, small gains in kindergarten and grade one, and a larger gain in grade two.

Observations of Newell show why the word watch was the most recurrent descriptor of his activities during his first few years of school:

> Newell watched while two children painted. He waited by the easel. When they were finished he continued to watch. I asked if he wanted to paint. He said, "Yes." . . . He worked long at this painting. The paint was carefully applied. He mixed yellow and blue. We had read a book about mixing colors.
>
> Newell made a leaf person with no help from me directly. He watched other children.

The record on Newell summarized the conclusions of the staff: "Watchfulness and close observation extend for Newell to all situations and are the basis of a strong memory, particularly for small detail, that emerges over time as a powerful factor in his approach to learning."

Continuing teacher observations such as these and the sharing of observations over time and grade levels, which the team structure facilitated in the indepth districts, formed the foundation for providing continuity in children's experiences during the early grades. The impact which this approach had on the performance of former PreK children illustrates the importance of reinforcing the prekindergarten experience as children progress through kindergarten and the primary school years.

Discussion

Answering the Original Questions

How does the evidence accumulated over the five years of the study answer the questions posed in the original evaluation plan?

1. Do prekindergarten programs have a measurable effect upon children's cognitive and noncognitive development between the time they enter and leave the program?

Yes. On three cognitive measures and three dimensions of noncognitive development PreK demonstrated a strong favorable effect.

2. Do prekindergarten children possess measurable advantages in cognitive development over non-prekindergarten children at the time of entry to kindergarten?

Yes. PreK children scored higher than children without PreK experience on school-related knowledge and skills and on general reasoning at the time they entered kindergarten.

3. Does prekindergarten experience have a measurable effect on children's cognitive development through the time they complete the third grade?

The answer to this question is a qualified "yes, in certain areas and under certain conditions." Definite effects of PreK on general reasoning, as measured by the Walker were found at the end of kindergarten. The longitudinal analysis revealed a general

effect on verbal concepts which was not differentiated from one grade to another. Going beyond the specific domain of cognitive development, the evidence showed that a greater proportion of PreK children than control-group children made normal progress through the third grade.

4. Are there specific variations in prekindergarten programs which result in significantly different levels of cognitive and other development in their students?

The most dramatic finding regarding variations in the program was the effect which parents' involvement had on the children's cognitive development. The more time parents were involved in the program, the higher their children tended to score on each of the three measures of cognitive development. Investigation of two other variations, not described in this report, produced little meaningful results. No consistent pattern was found of the effectiveness of different schedules. Problems of inadequate numbers of children for which data were available and attrition of children from the program resulted in no meaningful analysis of the effectiveness of home-based programs as an alternative to school-based programs.

5. Can program components or variations be identified which contribute to greater success of particular programs in producing lasting increases in the level of cognitive and other development?

There was evidence that parents' involvement in the program had a favorable effect on children's performance on the Peabody as late as the end of the first grade. Adding a staff development emphasis to increase continuity in the children's experience from PreK through grade three accounted for more lasting effects on both cognitive measures at the first-grade level and on the quantitative subtest of the CAT for some students at the second- and third-grade levels.

6. Will the systematic collection and analysis of data, carried out in examining the previous questions, provide a baseline for decision makers in studying staff, schedules, objectives, materials, child and parent characteristics, and children's mental ability and cognitive development?

The evaluation project demonstrated the value of systematically collecting and analyzing data for purposes required to successfully complete the project. That these purposes were primarily to make policy and funding decisions, rather than the kinds of program decisions mentioned in the question, does not detract from the potential of such a system to answer those kinds of questions.

The system can be used to answer questions related to policy and management. For example, the positive results of the staff development component to increase continuity and the parent involvement component suggest that these should be mandatory parts of an early childhood education program. The repeated finding that children benefitted most whose mothers had the least education suggests that mother's education--or lack of it--could be a useful criterion in selecting children for the program when it is not possible to enroll all the children who are otherwise eligible.

The New York State Board of Regents used the results of the evaluation in making proposals to the Governor and Legislature for the expansion of the program.

The system was used to accomplish a number of general tasks which made the successful completion of the evaluation possible. The system was used to manage an extremely large body of data and to manipulate that data to answer specific questions. The system was used also to solve some particularly difficult problems of broad-based field research, especially problems stemming from the infeasibility of randomly assigning children to the various groups to be studied and the more specific problem of the complete lack of a control group for certain analyses. Such a system could be used for many purposes in managing educational programs, but it requires planning, an array of technical competencies, regular attention, and commitment of resources.

The data analysis system used in the statistical portions of the evaluation project was complemented by the data and procedures used in the staff development component in the seven indepth districts. This component is well suited for making decisions about many of the factors mentioned in the question, as well as serving as a mechanism for expanding teachers' use of documentary information in planning the educational experiences of individual children. That the two purposes and two approaches could be combined in one study served to make them mutually supporting and provided confirming evidence that would not have been available otherwise.

Conclusion

In some respects the results of this evaluation of the New York State Experimental Prekindergarten Program resemble results of other studies of preschool programs. There were impressive effects found at the end of the PreK year, somewhat less impressive results at the kindergarten level, and a substantial reduction in the most obvious effects as the children progressed into the primary grades. However, it should be pointed out that there is evidence, scattered as it is, that the Prekindergaren Program had lasting effects on the children who attended.

The longitudinal study gave evidence that the program had a general effect, not restricted to grade level, on the children's knowledge of verbal concepts. The study of effects of continuity gave evidence that with appropriate follow up in the primary grades, certain effects, most notably those in the quantitative domain, may persist into the primary grades. There is evidence that the program was most effective for those children who most needed it, specifically, children whose mothers had the least education and children who scored lowest on one or more of the pretests. And there is strong evidence that when parents became involved in the program, their children scored better on measures of cognitive performance. Perhaps most important of all is the evidence that children from the PreK programs are more likely to make normal progress through the primary grades.

These findings are consistent with other recent findings concerning the beneficial effects of preschool programs. Lazar and his associates studied participants from twelve preschool programs for low-income children. The children ranged from 9 to 19 years of age at the time of the follow-up study. The investigators reported, among other findings, that participation in the preschool programs resulted in fewer placements in special education programs; fewer retentions in grade; higher IQ scores three years after the children left the preschool program and, in three of the projects, considerably longer; and higher scores on mathematics achievement test scores in the fourth grade (Consortium for Longitudinal Studies, October, 1978). An economic analysis indicated that preschool programs can pay for themselves by reducing the costs required to educate children as they move through the educational system; by freeing parents from child-care responsibilities so they can find employment; and by increasing the projected lifetime earnings of the children (Weber, Foster, and Weikart, 1978).

In the study reported here, the fact that all of the advantages the children obtained from the PreK program were not as evident four years later should not make us ignore the scattered but consistent evidence that program effects persisted well into the primary grades. The statistical evidence and the documentary evidence obtained in the staff development/continuity component provide a suggestion of the extent to which the entire early childhood program, from prekindergarten through the primary grades, can change the lives of children.

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